



**ES3**

**Pure Tone Audiometer**

**User's Guide**

Rev 1.11



**Micro Audiometrics**  
C O R P O R A T I O N

## **Precautionary Notes: Earscan® 3 Audiometer**

- 1. Use only the factory-supplied, UL approved, power adapter (wall cube) with the Earscan® 3. Use of any other power adapter will invalidate the warranty and may result in damage to the audiometer.**
- 2. The Earscan® 3 is designed for use with alkaline 1.5 volt AA size batteries. If re-chargeable batteries are used, they must be of the alkaline type. Do not use nickel-metal hydride (NiMH) or nickel cadmium (NiCad) rechargeable batteries.**
- 3. When installing batteries in the Earscan® 3, you must observe the correct polarity. If one or more cells are installed with reversed polarity, the instrument will not operate in the battery-powered mode, and the audiometer may be damaged.**
- 4. The Earscan® 3 is capable of producing signal levels greater than 100 dB SPL. Prolonged exposure to signals at these levels can result in temporary threshold shift or permanent hearing loss. When testing in manual mode at high HTL settings, limit signal duration to no more than 1 second.**
- 5. If the Earscan® 3 has only external power available (low batteries or no batteries installed), be aware that unplugging the mini DIN connector will result in power loss and potential data loss. If it is necessary to disconnect the mini DIN in this case (e.g., to switch from USB cable to printer cable), it is advisable to turn the instrument off, make the cable change, then turn the instrument back on.**
- 6. The Earscan® 3 does not implement handshaking protocol on the serial port. This means that the ES3 will not detect an unconnected serial port or a 'printer not ready' condition.**
- 7. Data stored on Earscan® 3 SD flash memory cards should be backed up to a PC on a regular basis to avoid potential data loss.**

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# INTRODUCTION

The Earscan 3 model ES3 is a pure tone, full frequency, air conduction audiometers. It provides manual/automatic threshold test capability with talk over. The ES3 is optimized for use in hearing conservation programs. It can be PC-controlled and optional provides data storage capability (via removable SD flash memory card), baseline comparisons and STS/PBI calculations.

ES3 audiometers are user customizable, can be battery or AC powered, and offer flexibility in communications. One of the most powerful ES3 features is the ability to be updated or upgraded via a PC attached to the Internet. Using factory supplied software, firmware updates/upgrades can be downloaded from the Micro Audiometrics website and installed on the ES3. Micro Audiometrics will be periodically adding new features to the ES3 firmware, and these features can be downloaded from the Micro Audiometrics website or obtained from an authorized Micro Audiometrics distributor.

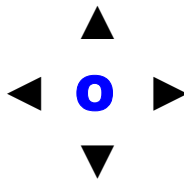
## Manual Conventions

The following conventions are used to indicate interactions with ES3:

KEY Presses appear in { }; e.g. {▲} means press the ▲ key.

Basic menu navigation is done using {▲} / {▼} and {◀} / {▶}.

Use the {○} key to **present tones**, **select menu items**, or **select list items**. It's the navigation key in the center of the array:

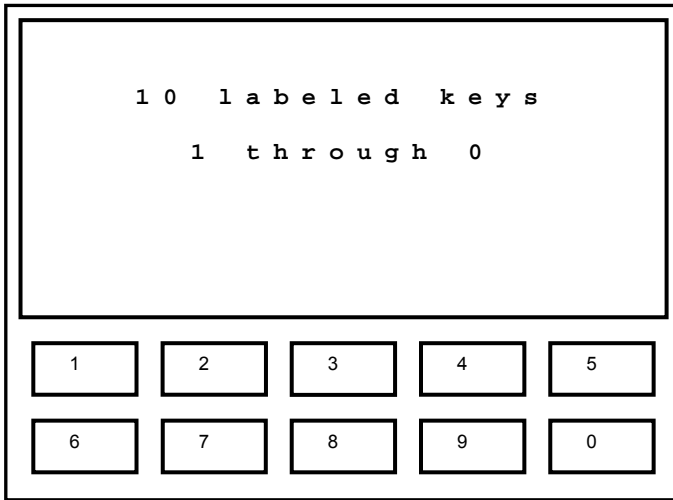


Menu sequences appear as ◀MENU1 ▶MENU2 ▶MENU3. The “◀” symbol is used to indicate “scroll to Menu Item and press the ○ key, or press the number key corresponding to the Menu Item”.

# Keypad

ES3 audiometers have a blue keypad/overlay with 10 keys, labeled 1 through 0 (see **Figure 1**).

**Figure 1. ES3 Keypad**



## Menu Navigation

The ES3 menu system is designed for intuitive use. Navigating through menus is as simple as using the {▲}, {▼}, {▶}, or {◀} keys to highlight a selection and then pressing {O} to make a selection. The {Menu} key is used to exit test mode and enter the menu system, and also to move from 'lower' to 'higher' menu screens. Pressing {Menu} while in manual audiometry mode enters the 'top level' of the menu system, and if the user has navigated 'down' into the menu structure, each {Menu} press will return to the next 'higher' menu level until the 'top level' menu is reached. Menu sequences are shown assuming that the user begins at the 'top level' menu.

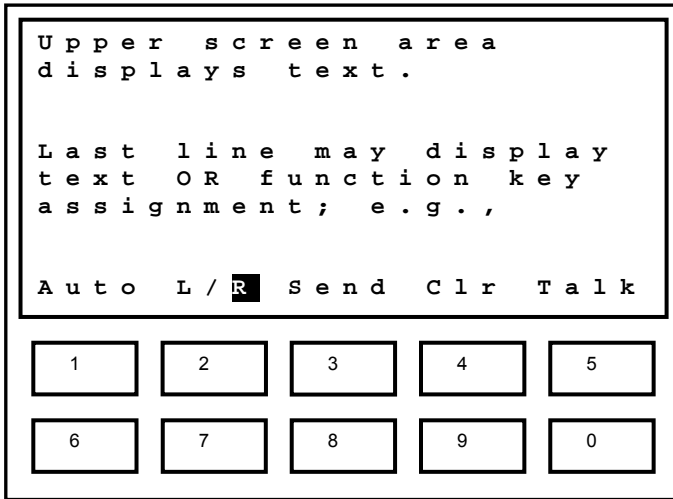
Note: The 'top level' menu can always be reached by repeatedly pressing {Menu}.

## Function Keys

At times, 'actions' or 'toggles' will be displayed on the bottom line of the LCD. The keys just below the display are then used as 'function' keys to perform an action (A), or to toggle between two possible parameter values (a/b).

**Figure 2** illustrates how keys are mapped to actions or toggles shown on the LCD.

**Figure 2. Mapping Function Keys to LCD Text**



In this illustrative example, there are four 'Actions' (Auto, Send, Clr, and Talk) assigned to 'Function' keys 1, 3, 4, and 5. Press **{1}** to perform action Auto, **{3}** to perform the action Send, **{4}** to perform action Clr, and **{5}** to perform action Talk. The 'L/R' shown above **{2}** indicates an L/R toggle with 'R' currently selected. Pressing **{2}** will toggle between the two possible states, and the state selected will be highlighted (e.g., **R**).



# SETUP

## Cable Connections

ES3 audiometers can be powered by 4 AA Alkaline batteries (battery compartment is accessible from the back of the instrument). Optionally, power from an AC adapter or USB bus power can be supplied via the 6-pin multi-purpose “mini DIN” connector on the top of the instrument. The AC adapter may be plugged directly into the ES3 mini DIN socket if serial communication is not required, or it may be plugged into the power adapter receptacle at the end of a printer cable or optional computer interface cable (RS-232). The headset and response button cable assembly plugs into the 15-pin connector on the top of the instrument.

Booth wall and headphone adapter cables are provided for installations that require patching through a booth. The booth adapter cable replaces the ES3 headphone/response button cable and terminates in three ¼” phone plugs compatible with standard booth patch panels. The headphone adapter cable provides ¼” mono phone plugs for TDH-39 headphones.

## Power Up

Press the **{On}** key, and the ES3 logo will scroll onto the screen unless scrolling has been disabled (see [Power Up Logo](#)), or the instrument was last powered down due to an inactivity time-out. When power-up initialization is completed, enter **{1}** to begin a new test or enter **{2}** to continue a previous test automatically saved by the ES3 at its last power down.

If you choose to begin a new test, the ES3 will prompt you to enter the Patient ID and an Operator ID. If the Test Analysis option is installed, it will also check to see if baseline data is available. If baseline data is found, you will be given the option to load the data. You will then be prompted to enter patient’s gender, age, number of hours since last noise exposure, and an Operator ID.

The manual audiometry screen will then be displayed and the instrument is ready to begin testing.

**Note:** When the ES3 powers down due to an inactivity timeout or in response to **-TURN OFF**, current test data is automatically saved to non-volatile memory. This prevents loss of data in case a test is interrupted. When the ES3S is powered back on, pending test data will be restored and the test can be continued, if desired, or a new test can be started.

## Power Options

Inactivity timeouts automatically turn off the LCD backlight and power after selectable periods of inactivity to conserve energy and extend battery life (see **Table 1**; ( ) indicates default setting).

**Note:** The backlight requires considerable battery power. Setting the backlight power-down interval longer than necessary will decrease battery life when the ES3 is battery powered (see [Screen Properties](#)).

**Table 1. Power Settings**

AC Backlight ▸ <b>SETUP</b> ▸ <b>POWER</b> ▸ <b>A/C</b> ▸ <b>BACKLIGHT</b>	(Never) 30 seconds 1 minute 2 minutes 5 minutes
AC Power Down ▸ <b>SETUP</b> ▸ <b>POWER</b> ▸ <b>A/C</b> ▸ <b>POWER DOWN</b>	Never 1 minute 5 minutes (15 minutes) 30 minutes 1 hour
Battery Backlight ▸ <b>SETUP</b> ▸ <b>POWER</b> ▸ <b>BATTERY</b> ▸ <b>BACKLIGHT</b>	5 seconds 10 seconds (20 seconds) 30 seconds 1 minute
Battery Power Down ▸ <b>SETUP</b> ▸ <b>POWER</b> ▸ <b>BATTERY</b> ▸ <b>POWER DOWN</b>	15 seconds 30 seconds (1 minute) 2 minutes 5 minutes

## Beep Volumes

Key presses are silent when in test mode, but produce audible 'beeps' when in the menu system. The beep volume can be set via the menu sequence **▸SETUP ▸BEEP VOLUMES ▸KEY VOLUME {Low/Medium/High}**. The ES3 also produces an alert sound when certain errors occur and to indicate the completion of an automatic test. The volume of the alert can be set via the menu sequence **▸SETUP ▸BEEP VOLUMES ▸ALERT VOLUME {Low/Medium/High}**.

## Talk Over

Talk over mode may be entered by pressing {5} while in audiometric testing mode. There is no specific microphone 'opening'; sound arrives at the microphone through various openings in the cabinet (e.g., the slot in the side). Talk over volume may be adjusted with the {▲}, {▼}, {▶}, or {◀} keys. It is recommended that a normal speaking voice be used at a distance of 1 to 2 feet, and volume adjustment used to compensate for hearing status of the listener. Press {1}, {Menu}, or {O} to exit talk over.

## Time and Date

The ES3 has a battery-backed up real time clock to maintain time and date. The clock is set at the factory prior to shipment. See section [Real-Time Clock Settings](#) for details on how to check or set the time and date. The backup battery is a lithium rechargeable type and will be recharged whenever ES3 power is on.

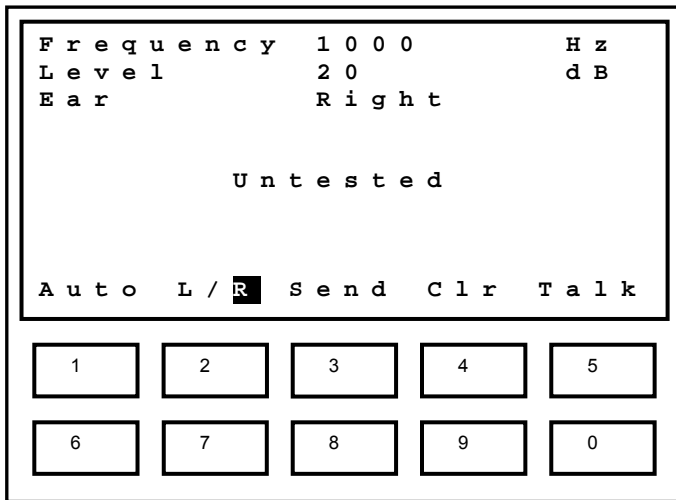
**Note:** If the ES3 is not powered up for many months, the battery may become discharged. In this case, the time and date will need to be reset and the instrument should be left powered up for some time to recharge the clock battery. Normal instrument usage is sufficient to keep the battery fully charged.

# MANUAL AUDIOMETRY

To insure that pending data is cleared, always begin a new test via the main menu sequence **FNEW TEST** to clear pending test data.

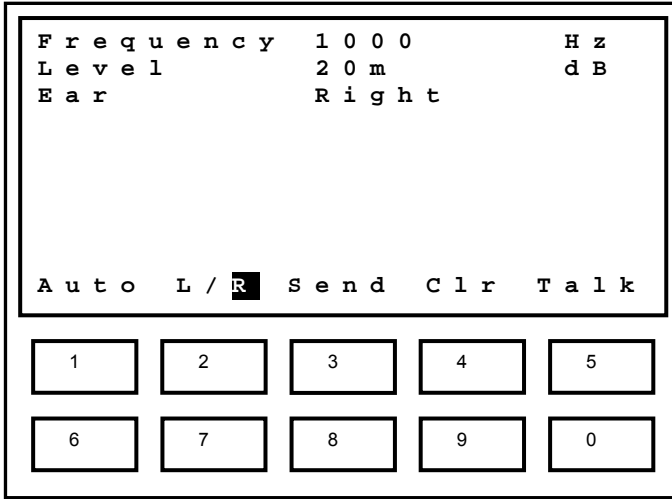
When the ES3 enters manual audiometry mode, the screen format shown in **Figure 3** will be displayed (assumes factory defaults for starting frequency and level).

**Figure 3. Manual Audiometry Display**



Once a threshold has been obtained, the display will change to show the threshold value (the 'm' indicates threshold was obtained via manual testing; see **Figure 4**).

**Figure 4. Display of Threshold**



The threshold may be cleared (Clr) by pressing key **{4}** (e.g., to retest a threshold). Only the currently-displayed threshold will be cleared.

The test ear, signal mode, starting frequency and starting level are all user selectable, so these values may differ from the ones shown. The example shown indicates that threshold of 20 dB has been obtained for the right ear at 1000 Hz.

## Manual Audiometry Key Functions

**Table 2** lists the functions of ES3 keys that are active in the manual audiometry mode. The last column indicates the action of the function keys.

**Table 2. Manual Audiometry Key Functions**

{◀}/{▶}		Select next lower/higher enabled frequency (Hz)
{▲}/{▼}		Increase/decrease level by current step size (dB)
{1}	Auto	Exit manual test mode and enter automatic test mode
{2}	L/R	Toggle between Left and Right ear, or among Left, Right and Binaural if binaural testing is enabled
{3}	Send	Send the test data to computer or printer
{4}	Clr	Clear the current threshold
{5}	Talk	Exit test mode and enters talk over mode
{Menu}		Exits manual test mode and enters the menu system

## Testing Procedure

- 1) Instruct the patient to raise his/her hand or press the patient response button (if available) whenever a tone is heard.
- 2) Position the headphones over the patient's ears (**Red** over **Right** ear, **Blue** over **Left** ear).
- 3) Press **{2}** if necessary to toggle to the desired test ear.
- 4) Select the test frequency using the **{◀}** / **{▶}** keys.
- 5) Use the **{▲}** / **{▼}** keys to adjust the hearing level and the **{O}** key to present the stimulus to the selected ear. When testing with Continuous signals, stimulus duration should be about **1 second**; the minimum duration allowed is 200 ms.
- 6) Continue using the **{▲}** / **{▼}** and **{O}** to present stimuli consistent with the test paradigm being used (typically Hughson-Westlake) until threshold is determined.
- 7) Use the **{◀}** / **{▶}** keys to select the next frequency to test.
- 8) Repeat steps 4 through 7 until threshold has been determined for each frequency for the selected ear.
- 9) Change the test Ear by pressing **{2}**.
- 10) Repeat steps 4 through 8 until threshold has been determined for each frequency for the second ear.

## Manual Audiometry Options

### Frequency Selection

Note that the set of test frequencies selected for manual audiometry will also be used during automatic threshold testing. By default the frequency set includes 250, 500, 1000, 2000, 3000, 4000, 6000, and 8000 Hz, plus the 1k/Validity check. The 1k/Validity check is mainly used during an automatic threshold exam, but can also be tested during a manual exam if desired.

The frequency set to be used for manual or automatic threshold testing may be viewed or modified via the menu sequence **▸SETUP ▸AUDIOMETRY SETUP ▸FREQUENCIES**. The display will show the list of available test frequencies and there will be a check mark (✓) next to the ones currently selected for testing. Use the **{▶}**, **{▲}**, **{▼}** and **{◀}** keys to move the highlight to a frequency to select or deselect for testing, and press **{O}** to toggle between 'selected' and 'deselected'. Repeat this process as necessary to select or deselect other frequencies.

Once selections are completed, press **{Menu}** to exit frequency selection mode and return to the menu system.

## Other Options

Additional manual audiometry options listed in **Table 3** may be accessed via the menu sequence **▢SETUP ▢AUDIOMETRY SETUP ▢MANUAL AUDIOMETRY**. To change an option, highlight the option to modify using the **{▶}**, **{▲}**, **{▼}** and **{◀}** keys, and press **{○}**. Use the **{▶}**, **{▲}**, **{▼}** and **{◀}** keys to select the desired setting for the option, and press **{○}**.

**Table 3. Other Manual Audiometry Options**

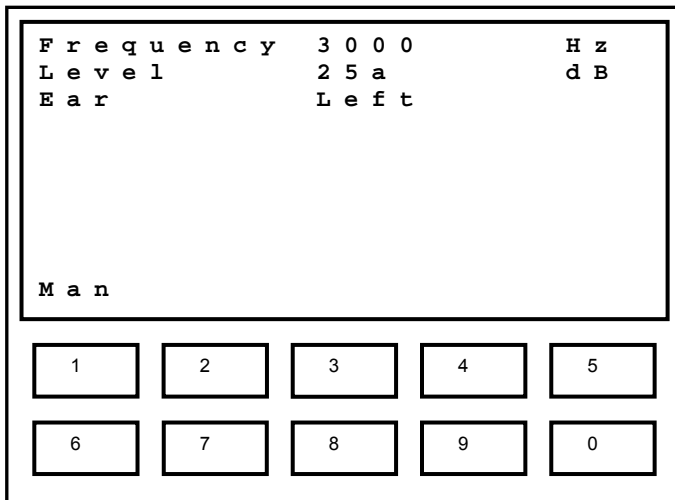
Ear	Ear to be tested first.	Left, (Right)
Starting Level	Initial level when new test is started	10, 15, (20), 25, 30, 35, 40
Starting Frequency	Initial frequency when entering manual test mode	125, 250, 500, (1000), 1500, 2000, 3000, 4000, 6000, 8000, 1k/V
Tone Mode	Stimulus mode	(Pulsed), Continuous
Increment Amount	Increment step size	(5), 10, 20
Decrement Amount	Decrement step size	5, (10), 20
Binaural Stimulus	Enable presentation to both ears simultaneously	(No), Yes

# AUTOMATIC THRESHOLD AUDIOMETRY

To insure that pending data is cleared, always begin a new test via the main menu sequence **NEW TEST** to clear pending test data.

The automatic threshold test option performs a modified Hughson-Westlake test. **Figure 5** shows the display format used for Automatic Threshold tests. This example indicates that a threshold of 25 dB was registered in automatic test mode (indicated by “a”) for 3000 Hz at the left ear.

**Figure 5. Automatic Threshold Display**



## Automatic Threshold Function Key

Pressing **{1}** (Man) during an automatic threshold exam will stop the test and return the ES3 to the manual audiometry mode. Note that exiting the test does **not** clear test data. The test may be re-entered and continued from the point at which it was interrupted.



## Test Procedure

- 1) Instruct the patient to press the response button whenever a tone is heard.
- 2) Position the headphones over the patient's ears.
- 3) From the manual audiometry screen, press key **{1}** to begin the automatic threshold exam.

## Test Protocol

- 1) The automatic test begins at the level and frequency indicated in the automatic threshold audiometry settings.

If the Faster Method setting is selected:

The stimulus increment size is set to the Gross Increment size in the automatic threshold audiometry settings. The increment size remains at this setting until the first response by the patient to a stimulus. After the first response, the increment step size is set to the Increment Amount in the automatic threshold settings. The stimulus decrement size is set to the Gross Decrement size in the automatic threshold audiometry settings. The decrement size will remain at this setting until the first negative response by the patient to a stimulus. After the first negative response, the decrement size is set to the Decrement Amount in the automatic threshold settings.

If the Faster Method setting is not selected:

The stimulus increment size is set to the Increment Amount and the decrement size is set to the Decrement Amount in the automatic threshold settings.

- 2) After each stimulus presentation, ES3 will either decrease the intensity level by the decrement size if the patient responded or increment the intensity level by the increment size if the patient did not respond.
- 3) The number of consecutive ascending positive responses at a given level is selectable in the automatic threshold audiometry settings. An ascending positive response is a positive response to a stimulus presentation that immediately follows a negative response to the previous stimulus presentation.
- 4) If the stimulus is presented at the maximum level for a given frequency and a negative response is received by the ES3, the threshold for the frequency is set to a No Response (NR) and the test continues with the next frequency selected for testing.
- 5) Testing for the next frequency in the test sequence will automatically start at an intensity level 10 dB HTL greater than the threshold for the previous frequency. However, the test level will not exceed the maximum starting level contained in the Level Override setting in the automatic threshold audiometry settings. Additionally, if both the test storage and baseline comparison upgrades are installed, the Use Baseline setting specifies that testing will begin at the threshold for the baseline test if one exists and is loaded.

- 6) After testing at all the selected frequencies for the ear, the ES3 will examine the other ear to see if testing has been completed for each frequency. If the opposite ear has not been tested, ES3 will select the opposite ear, and begin testing in the manner described beginning with step 1. If both ears have been tested, the test is complete and ES3 will return to the manual audiometry mode.

## Automatic Threshold Test Error Conditions

If an error is encountered during an automatic threshold test, the ES3 will stop the test and indicate the error condition. The operator may re-instruct the patient via talk over mode and resume testing, or return to manual audiometry mode. **Table 4** lists the error conditions that the ES3 detects.

**Table 4. Automatic Threshold Audiometry Errors**

Button Held	Patient is holding down response button.
False Response	Patient pressed response button outside the valid response “window” or when no tone was presented.
Inconsistent Results	A valid threshold was not obtained. Testing stopped at the point where the error occurred.
Validity Error	The 1k and 1k/V thresholds differ by more than 5 dB.

## Automatic Threshold Audiometry Options

### Frequency Selection

Frequencies used during automatic threshold testing are the same as those for a manual test (see [Selecting Frequencies](#)).

### Frequency Presentation Order

Frequency presentation order may be changed via the menu sequence **▸SETUP ▸AUDIOMETRY SETUP ▸AUTO THRESHOLD ▸FREQUENCY ORDER**. The default sequence is 1k/V, 500, 1000, 2000, 3000, 4000, 6000, and 8000 Hz. Only those frequencies selected for testing will be used.

To change presentation order, move the highlight with the **{◀}** / **{▶}** or **{▲}** / **{▼}** keys and press **{○}** to select a frequency. Move it to any position in the list using the **{◀}** / **{▶}** or **{▲}** / **{▼}** keys, and press the **{○}** key to place it at that position. When all frequencies are in the desired presentation order, press **{Menu}** to exit.

## Other Options

Basic automatic threshold test options (see **Table 5**) are selectable via the menu sequence **▸SETUP ▸AUDIOMETRY SETUP ▸AUTO THRESHOLD**.

**Table 5. Basic Automatic Threshold Test Options**

Ear	Starting ear for automatic threshold exam	Left, (Right), Better Ear
Frequency Order	Frequency presentation order	1kV, 500, 1000, 2000, 3000, 4000, 6000, 8000,
Starting Level	Starting level for automatic threshold test	10, 15, 20, 25, (30), 35, 40
Increment Amount	Level increment size	(5), 10, 20, 30
Decrement Amount	Level decrement size	5, (10), 20, 30
Gross Increment	Increment step size to use until positive response has been registered	5, 10, (20), 30
Gross Decrement	Decrement step size to use until negative response has been registered	5, 10, (20), 30

Advanced automatic threshold test options (see **Table 6**) are selectable via the menu sequence **▸SETUP ▸AUDIOMETRY SETUP ▸AUTO THRESHOLD ▸MISCELLANEOUS**.

**Table 6. Advanced Automatic Threshold Test Options**

Level Override	Maximum starting level when changing frequency during automatic threshold exam.	40, 45, 50, 55, 60, (65), 70
Faster Method	Should gross increments and decrements be used?	No, (Yes)
Stop On Inc.	Should test be stopped if a reliable threshold cannot be determined?	No, (Yes)
Max Presentations	Maximum stimuli allowed per frequency before reporting 'inconsistent' error.	15, (20), 25, 30, 35, 40
Use Baseline (requires test storage & baseline upgrades)	Should baseline thresholds be used to determine initial test level?	No, (Yes)
1k/V Test Both Ears	Should 1k/Validity be tested for both ears?	No, (Yes)
Max False Responses	Maximum 'false responses' allowed before reporting an error.	1, 2, 3, 4, (5), 10
Ascending Responses Req	Number of consecutive ascending responses required to determine threshold.	1, (2), 3, 4, 5

## SUBJECT DEMOGRAPHICS

Subject demographic information can be stored along with threshold information on the ES3 with the Test Storage upgrade. Demographic information can be entered at any time via the menu sequence **F****DEMOGRAPHIC INFO**, and automatic prompts for demographic information will appear when starting a new test.

**Table 7** lists the demographic information that is stored. Numeric demographic information is entered via the number keys. Gender is entered using the scroll keys.

**Table 7. Subject Demographic Information**

Patient ID	Up to 21 digits
Age	1 to 99
Gender	Male or Female
Last Noise Exposure	Hours since significant noise exposure: 1 to 99
Operator ID	Up to 21 digits

# TEST RESULTS

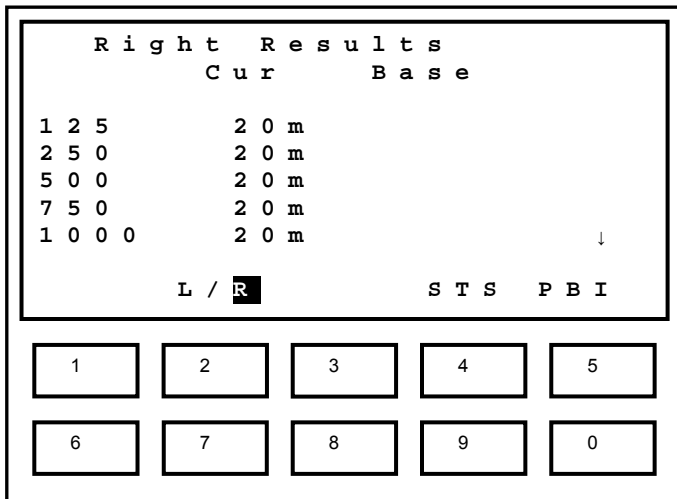
Audiometric test results can be displayed on the LCD, stored to a memory card or transmitted to an attached PC or printer.

## Displaying Results on the LCD

Test results are displayed via the menu sequence **▸DISPLAY RESULTS**. Thresholds obtained via automatic testing are displayed with an 'a', and screening levels obtained via automatic testing are displayed with an 's'. **Figure 6** shows partial results obtained in manual test mode for the Right ear (indicated by the 'm' next to the threshold).

The {◀}, {▶}, {▲}, or {▼} keys are used to scroll up or down through the results list. Press {2} (L/R) to toggle between display of Left or Right ear data, respectively. When baseline data is available (ES3 with Test Analysis option), it is displayed in a column under the 'Base' heading. In this example, STS and PBI calculations are available, so {4} would display STS calculations and {5} would display PBI calculations. The formulae used for PBI calculations is selected via **▸SETUP ▸AUDIOMETRY SETUP ▸IMPAIRMENT CALC.** {AAO-1979 / AAO-1965/AMA-1947 / NIOSH / CHABA / Illinois / New Jersey / Wisconsin}.

**Figure 6. Audiometric Test Results Display**



## Display Results Key Functions

Table 8 lists the valid keys when in the display test results mode.

**Table 8. Display Results Key Functions**

{2}	Toggle between left and right ear test results
{4}	Display STS and STS with Presbycusis results (Baseline upgrade)
{5}	Display PBI using selected formula (Baseline upgrade)
{◀}, {▶} {▲}, {▼}	Scroll the display screen
{Menu}	Exit display mode and return to the menu system

## Quantifying Hearing Loss

Table 9 provides a general reference for converting threshold in decibels to degree of hearing loss.

**Table 9. Scale of Hearing Loss**

0 – 20 dB	Hearing within normal limits
25 – 40 dB	Slight to mild hearing loss
45 – 55 dB	Moderate hearing loss
60 – 70 dB	Moderately severe hearing loss
75 – 90 dB	Severe hearing loss
90 dB+	Profound hearing loss

## DATA STORAGE

The ES3 with the Test Storage option can store audiometric test results on a standard, removable, SD flash memory card. Utilizing widely adopted flash storage cards facilitates transfer of test results between a PC database management system and the ES3.

**Caution:** It is important to make **frequent backups** of data to the PC to avoid potential loss of data (e.g., if a card is lost or damaged).

The memory card must be formatted with the FAT16 file system. Most memory cards come preformatted with FAT16, and this format can also be specified when formatting a card, e.g., using Microsoft® Windows® and a SD card reader. The number of audiometric exams a memory card can hold is dependant on the size of the memory card. A 128 MB memory card, for example, can hold more than 50,000 audiometric exam records.

The ES3 stores files in a directory named 'Earscan3'. This directory contains 'patient' directories whose names correspond to the patient ID number. Each patient directory contains audiometric test results. The name of each audiometric test result file is the date on which that audiometric test was performed. These simple rules allow easy navigation to, and searching for, patient information and files. An example of a complete path to an audiometric test is:

**\\Earscan3\1234567890\01-24-2004.e3a.**

For this example, the **Patient subdirectory** is '**1234567890**' and the **Test data file** is '**01-24-2004.e3a**'.

## **Saving Tests**

Tests can be saved to the memory card using the menu sequence **▢FILES ▢SAVE TEST**. Once the test has been saved, the LCD indicates this and returns to the menu system.

## **Loading Tests**

Data can be retrieved from a memory card using the menu sequence **▢FILES ▢LOAD TEST**. Enter the patient ID, and if there are test data files for the patient on the memory card they will be displayed. Use the **{▶}**, **{◀}**, **{▲}** and **{▼}** keys to select the file to be loaded and press the **{○}** key. When the test is loaded, the ES3 will return to the manual audiometry mode.

If baseline data is available for the patient, you will be given the option of loading the baseline data for the right and for the left ear. Baseline data for the current patient may also be loaded via the menu sequence **▢FILES ▢LOAD BASELINE**.

## Marking Baseline Test

A saved test file can be marked as a baseline data file via the menu sequence **▸FILES ▸MARK BASELINE TEST**. Enter the patient ID and test files for the patient will be displayed. Select the file to mark, and then select {Left Baseline / Right Baseline / Both / Cancel}. Individual selection of left and right baseline designation allows selection of tests at different times to be used for left and right baseline.

## SERIAL COMMUNICATIONS

The ES3 can transmit data to a **computer** or to a **printer**. The default output device is selected using the menu sequence **▸SETUP ▸COMMUNICATIONS ▸DEFAULT OUTPUT**, and data is transmitted using the **▸SEND DATA** main menu option. Note that the ES3 implements **no handshaking protocol** for serial communications. This means that the ES3 cannot detect an unconnected serial port or a 'not ready' state. It is the user's responsibility to verify that a serial cable is connected and that the external device (printer or computer) is powered up and ready for communications before attempting to transmit data.

NOTE: While an Earscan 3 is attached to the PC using the supplied USB cable, it is automatically configured for output to a PC at a baud rate of 115.2k, and no setup changes are required.

## Transmit Options

**Table 10** lists optional settings associated with transmitting data.

**Table 10. Data Transmit Options**

Default Output	Output data destination	(Printer), Computer
Baud Rate	Serial port BAUD rate	(9600), 28.8k, 57.6k, 115.2k
Insert Linefeed	Insert linefeed after after each line (for printer use)	No, (Yes)
Auto Send Data	Automatically send completed test to attached printer or PC	No, (Yes)



## BASELINE COMPARISONS

The ES3 with the Test Analysis option can perform audiometric exam baseline comparisons. When **NEW TEST** is selected via the menu system and baseline data exists, the patient's baseline data may be loaded so that current test results can be compared to baseline results.

Threshold information in a baseline test may be used by the automatic threshold test to determine starting levels for threshold testing. This option is selected via the menu sequence **SETUP AUDIOMETRY SETUP AUTO THRESHOLD MISCELLANEOUS** menu: **USE BASELINE**. If the baseline does not have threshold information for a frequency, the normal procedure is used to set the starting level for that frequency.

The Display Results screen will include baseline information next to the current test data in the Left and Right Ear results screens. STS and PBI selections also become available. Baseline test information will be included with current test data when test data are transferred to computer or printer.

## SCREEN AND CLOCK OPTIONS

LCD brightness and contrast are user adjustable to allow optimizing the display for differing viewing conditions (e.g., ambient lighting or viewing angle). The contrast setting has no appreciable effect on battery life, but higher brightness settings require more power and will decrease battery life. The amount of time that the backlight remains on during periods of inactivity is user selectable, and should be set to as low a value as is convenient to preserve battery life.

The ES3 includes a real-time clock with rechargeable lithium battery backup to maintain time and date. Time can be set/displayed in either 12- or 24-hour format. Date can be set/displayed in dd/mm/yyyy or mm/dd/yyyy format. The battery is recharged when the ES3 is powered on. When fully charged it should maintain the real-time clock for at least a year, even if the instrument is not used. In the unlikely event that the clock battery should become discharged, the time and date would need to be reset and the instrument left on long enough to recharge the backup battery.

### Screen Properties

The LCD Screen is preset at the factory with typical contrast and brightness settings. Adjusting either setting may necessitate adjusting the other; e.g., increasing screen brightness may require changing contrast for optimum viewing.

LCD contrast can be adjusted via the menu sequence **↵SETUP ↵DISPLAY ↵CONTRAST**. Use the **{◀}** / **{▶}** keys to adjust contrast to the desired setting. Press **{O}** to save the setting, or press **{Menu}** to exit without changing the contrast setting.

LCD brightness can be adjusted via the menu sequence **↵SETUP ↵DISPLAY ↵BRIGHTNESS**. Use the **{◀}** / **{▶}** keys to increase or decrease brightness. Press **{O}** to save the setting, or press **{Menu}** to exit without changing the brightness setting.

**Note:** A brighter backlight requires more battery power. Setting the backlight brightness to a value greater than needed will decrease battery life.

### Power-Up Logo

At power up, the ES3 logo can either scroll slowly onto the screen or just appear as a full-screen display. This option is set via the menu sequence **↵SETUP ↵DISPLAY ↵SCROLL LOGO**. Select “Yes” for the scrolling display, or “No” for the full-screen display.

**Note:** If the ES3 powers down due to an inactivity timeout, the logo display will be skipped when the instrument is powered back up to minimize re-start time. Re-start will proceed directly to the manual audiometry screen.

### Real-Time Clock Settings

The date format is selected via the menu sequence **↵SETUP ↵DATE ↵SET DATE FORMAT**. The format may be set to **mm/dd/yyyy** or **dd/mm/yyyy**. The date may be set (or viewed) via the menu sequence **↵SETUP ↵DATE ↵SET DATE**. A new date must be entered in the currently selected date format (i.e., dd/mm/yyyy or mm/dd/yyyy). Press **{O}** to save the date setting, or **{Menu}** to exit without changing the time setting.

The time format (12 or 24 hour) can be selected via the menu sequence **↵SETUP ↵DATE ↵SET TIME FORMAT**. The ES3 real time clock can be set (or time viewed) via the menu sequence **↵SETUP ↵DATE ↵SET TIME**. A new time must be entered in the currently selected format (12- or 24-hour). Press **{O}** to save the time setting, or **{Menu}** to exit without changing the time setting.

## LOCK SETTINGS

All user selectable instrument settings may be “locked” if desired via the menu sequence **▸SETUP ▸GENERAL ▸LOCK SETTINGS**. Enter a password and press **{O}** to lock all user settings at their current state.

**Caution!** Be sure to record or memorize the password used to lock instrument settings. It will be required to unlock settings.

To unlock settings, enter the menu sequence **▸SETUP (password) ▸GENERAL ▸Unlock SETTINGS** and enter the password that was used to lock the settings.

## RESET SETTINGS

All user selectable instrument settings may be returned to factory default values via the menu sequence **▸SETUP ▸RESET SETTINGS**. Calibration data will not be affected.

**Caution!** Applying ‘Reset Settings’ will return all user-selectable settings to factory defaults. User settings that differ from factory defaults will be lost.

## FIRMWARE UPGRADE

The embedded software in the ES3 (the firmware) can be updated (e.g., when new features are added or maintenance releases are made available). Updated firmware and the PC application required to install updates will be available from distributors or may be downloaded from the Micro Audiometrics web site. Firmware load is done via the ES3 USB interface. In order to install new firmware, the ES3 must be placed in update mode by holding down the **{Menu}** key as the instrument is powered on by pressing the **{On}** key. Once the firmware update is completed, the ES3 will return to normal operational mode.

**Note:** If the ES3 is inadvertently put into Update Mode, it will remain in that mode until the firmware is updated or until the instrument power is disrupted (e.g., by unplugging the wall cube and/or removing at least one battery).

# HEADSET MANAGEMENT

The ES3 supports both a **Primary** and a **Secondary** headset, and either headset may be a Telephonics TDH-39 (60-Ω) or an E·A·R Auditory Systems E·A·RTONE 5A (50-Ω) (referred to as EAR-5A).

**Note!** Primary and Secondary may denote headsets of different types or headsets of the same type (e.g., two TDH-39 or two EAR-5A headsets).

When the ES3 is equipped with only one headset, this should be indicated by selecting “None” for the secondary headset type via the menu sequence **↵SETUP ↵GENERAL ↵PERFORM CALIBRATION (password) ↵CALIBRATE SECONDARY ↵HEADSET TYPE {NONE}**. ES3's ordered with a single headset will have this setting by default.

When two different headsets are available, the headset being used for audiometric testing must be correctly specified to ensure that the correct calibration values are applied. If the primary and secondary headsets are of the same type (e.g., two sets of TDH-39 or two sets of EAR-5A) it is still important to keep track of which headset is designated as the Primary one and which as the Secondary one, since different earphones, even of the same type, will likely have different transducer correction values. Specification of the headset to be used for testing is done via the menu sequence **↵SETUP ↵GENERAL ↵HEADSET FOR TESTING {Primary/Secondary}**. If only one headset is equipped, “Primary” will be the only choice displayed.

**Caution:** When specifying **Primary/Secondary** headset for calibration or TDH-39/EAR-5A headset type to be used for testing, the **selection MUST MATCH** the headset that is actually attached to the ES3.

Special hex screws are used to attach the headset cable to the ES3. Use of these screws serves as a reminder that headset assemblies should not be casually exchanged. Insert phones attach to the cable via plug-in connectors, so it is the responsibility of the user to insure that Right and Left phones are not switched and that the correct phones are attached.

Calibration mode must be accessed to calibrate the earphones, to specify Primary and Secondary headset types, and to change the calibration date. Calibration mode is **password protected** to minimize the risk of inadvertent changes (e.g., while ‘browsing’ through menus). Please see the ES3 **Calibration Guide** for more detailed information regarding headset management and calibration.

Specification of headset type should only be done during **calibration** (i.e., when selecting which type of earphone is being calibrated). Specification of the **Primary**

headset type is done via the menu sequence **▸SETUP ▸GENERAL ▸PERFORM CALIBRATION (password) ▸CALIBRATE PRIMARY ▸HEADSET TYPE {TDH-39/EAR-5A}**. Specification of the **Secondary** headset type is done via the menu sequence **▸SETUP ▸GENERAL ▸PERFORM CALIBRATION (password) ▸CALIBRATE SECONDARY ▸HEADSET TYPE {TDH-39/EAR-5A/None}**. If no secondary headset is equipped, 'None' should be selected.

## CALIBRATION

Micro Audiometrics recommends that audiometers be calibrated annually. About one month before the annual calibration due date, the ES3 will begin displaying a reminder at power up that the due date is approaching. This reminder will be cleared once the instrument is calibrated. If the calibration due date passes and the instrument has not been calibrated, a caution will be displayed regarding potential test data invalidation.

**Note:** If the audiometer is equipped with two headsets, separate calibration due reminders will occur.

The last calibration date and calibration due dates may be viewed at any time via the menu sequence **▸SETUP ▸GENERAL ▸CALIBRATION DATES**. Please see the **ES3 Calibration Guide** for more detailed information regarding headset management and calibration.

# TECHNICAL SPECIFICATIONS

**ANSI S3.6 Type:** 4  
**Frequencies (Hz):** 125, 250, 500, 750, 1000, 1500  
(+/- 1%) 2000, 3000, 4000, 6000, 8000

## Levels

<b>TDH-39</b>	125 Hz	-10 to 65
<b>(60 Ω)</b>	250 Hz	-10 to 90
<b>Phones</b>	500 thru 6000 Hz	-10 to 100
<b>(+/- 1 dB)</b>	8000 Hz	-10 to 90
<b>EAR-5A</b>	125 Hz	-10 to 65
<b>(50 Ω)</b>	250 Hz	-10 to 95
<b>Phones</b>	500 thru 1500 Hz	-10 to 100
<b>(+/- 1 dB)</b>	2000 and 3000 Hz	-10 to 95
	4000 and 6000 Hz	-10 to 90
	8000 Hz	-10 to 85

**Attenuation:** 5, 10, 20 db steps  
**Presentation:** Pulsed or Continuous  
**Repetition Rate:** Random intervals  
**Test Modes:** Manual, Automatic Screening / Threshold

**Display:** 128 x 64 Backlit LCD  
**Clock:** Real-time with lithium battery backup  
**Communications:** USB, RS-232  
**Headset:** TDH-39 60 Ω (standard), EAR-5A 50 Ω (opt)  
**Power:** 4 AA Alkaline Batteries, A/C adapter, USB Bus

**Standards Met:** ANSI S3.6-1996, ANSI/AAMI ES1:1993

**Test Storage:** On SD Cards (FAT16 file system)  
Capacity dependant on SD density

## FUNCTIONAL ‘QUICK CHECKS’

The following checks can be used to verify instrument operation and to help narrow the focus for solving problems.

At power-up after a manual power-down, the ES3 logo should either scroll onto the LCD or appear quickly, depending on the scroll setting, and the backlight should be on. After an inactivity timeout power-down, the logo is bypassed. In either case, the ES3 should proceed to the “Select An Option:” screen and should respond to keypad control.

**Keypad** operation can be tested by pressing keys and verifying that the appropriate response occurs (e.g., pressing {▲} increases level, {▶} increases frequency, etc.). The speaker should produce audible ‘ticks’ when keys are pressed while in the menu system (keys are silent in test mode).

Next, check signal generation and keypad control. Set frequency to 1000 Hz, set level to 70 dB HTL, and press {○}. A tone (pulsed or continuous) should be heard at a comfortable loudness level. Verify that the signal is heard at the correct ear. Press {▲} {○} and {▼} {○} to verify that signal loudness increases or decreases, respectively. Press {2} {○} and verify that the signal is presented to the other ear.

Plug in a **response button** and verify that pushing the button causes the “\*” symbol to appear near the center of the display.

Enter the menu sequence ▸SETUP ▸DATE ▸SET TIME and verify that the time is correct and that the seconds count is incrementing.

Attach the **printer**, verify that printer output is selected via the menu sequence ▸SETUP ▸COMMUNICATIONS ▸DEFAULT OUTPUT, and transmit data to the printer via the ▸SEND DATA main menu option.

# TROUBLE SHOOTING GUIDE

Problem	Possible Solution
ES3 does not power up.	Check batteries or verify that wall cube is attached and plugged in.
Signal is missing or intermittent.	<ol style="list-style-type: none"> <li>1. Verify that headset/response button cable connector is securely attached and mounting screws are snug.</li> <li>2. Move or gently bend headset cable to see if problem “comes and goes” – if so, there may be a break in the wiring.</li> <li>3. Verify that screws holding the “fork” connectors at each earphone are snug.</li> </ol>
Subject response button does not work.	<ol style="list-style-type: none"> <li>1. Verify that headset/response button cable connector is securely attached and that mounting screws are snug.</li> <li>2. Disconnect response button plug from headset/response button cable, clean plug, and reconnect.</li> </ol>
Data is not properly sent to computer.	Reference: “Transmitting Data” <ol style="list-style-type: none"> <li>1. Verify that ‘output to computer’ is set.</li> <li>2. Verify that baud rate matches computer baud rate.</li> <li>3. Verify that interface cable is in place and computer is ready to receive data.</li> </ol>
Printer fails to print or prints incorrect characters.	Reference: “Transmitting Data” <ol style="list-style-type: none"> <li>1. Verify that ‘output to printer’ is set.</li> <li>2. Verify that printer is attached, power is “On”, and printer is ready to print.</li> </ol>
The printer does not properly feed paper.	Verify that paper is installed correctly and not jammed.
The printer appears to be printing, but nothing shows up on the paper.	Paper is in backwards. Fax (thermal) paper prints only on shiny side.



# EXTERNAL INTERFACE

## Connectors

The ES3 form factor necessitates a non-standard approach to headset and interface cable attachments. The headset attaches to a high-density 15-pin D-Subminiature connector, and is held in place with allen (hex) head screws to minimize the possibility of accidental mismatch of headset to instrument. All other cables are attached via a multi-purpose 6-pin mini DIN connector. The ES3 wall cube, printer/power cable, USB cable, or serial computer/power cable may be attached to the mini DIN connector. Connector pin outs are as follows:

### Multi-purpose Connector

6-pin mini DIN (pin configuration is shown as viewed from top of instrument)

Pin	Function	Pin	Function		
1	Ground	4	USB D+	6	5
2	+5 V In	5	RS-232 RX	4	3
3	RS-232 TX	6	USB D-	2	1

#### Notes:

- 1) The wall cube connector uses pins 1 and 2 for power.
- 2) Serial cables use pins 3 and 5 for RS-232 and pins 1 and 2 for power (assuming wall cube is plugged into the cable's mini DIN 'pigtail').
- 3) The USB cable uses pins 1 and 2 for USB bus-power (requires about 120 ma) and pins 4 and 6 for USB data.

## Headset Connector

15-pin high density D-Sub (pin configuration is shown as viewed from top of instrument)

Pin	Function	Pin	Function
1	+5 V Out	9	Not Used
2	Lt Phn+	10	Not Used
3	Lt Phn-	11	Ground
4	Rt Phn+	12	Not Used
5	Rt Phn-	13	Not Used
6	RspButton	14	Not Used
7	Ground	15	Not Used
8	Not Used		

## DPU-414 Printer Switch Settings

The setup switches on the Seiko Instruments DPU-414 printer should be set as follows to ensure compatibility with Micro Audiometrics ES3 audiometers.

SW1 - 1 - OFF	SW2 - 1 - ON	SW3 - 1 - ON
2 - ON	2 - ON	2 - ON
3 - ON	3 - ON	3 - ON
4 - ON	4 - ON	4 - OFF
5 - ON	5 - ON	5 - OFF
6 - OFF	6 - ON	6 - ON
7 - ON	7 - ON	7 - ON
8 - ON	8 - OFF	8 - ON

## EARSCAN 3 INFORMATION

General Earscan 3 information is displayed via the menu sequence **▸SETUP** **▸GENERAL** **▸EARSCAN 3 INFO.** (e.g., see **Figure 7**). Serial number and firmware revision are important when upgrades, updates, and/or service are being considered.

**Figure 7. Information Display**

```
Earscan 3 Audiometer
ANSI S3.6, Type 4
SN: 010303000001
Firmware: 2.01.001
Copyright 2006,
Micro Audiometrics
www.earscan.com
(866) EAR-SCAN
```

# **WARRANTY**

## **MICRO AUDIOMETRICS CORPORATION LIMITED WARRANTY**

### **EARSCAN 3 PURE TONE AUDIOMETER**

1. This is a "LIMITED WARRANTY" as defined in the Consumer Product Warranty and Federal Trade Commission Improvement Act. This WARRANTY gives you specific legal rights and you may also have other rights that vary from state to state.
2. Micro Audiometrics Corporation warrants this Earscan 3 Pure Tone Audiometer to be free from defects in materials and workmanship for three (3) years and headset for one (1) year under normal use. This warranty applies only to the original customer, and only on units purchased and used solely in the United States. Micro Audiometrics Corporation may, at its sole and exclusive option, replace this product.
3. This WARRANTY does not apply to any product damaged by accident, misuse, alteration or abnormal condition of operation, or if the products were altered or repaired by anyone other than Micro Audiometrics Corporation or one of its Authorized Equipment Service Centers.
4. This WARRANTY does not cover cartons, carrying cases, noise reducing enclosures, cables, batteries, broken or marred cabinets, or any other accessories used in connection with the product, or consequential damages due to a defect in the product.
5. This WARRANTY begins on the date of purchase. For your convenience, keep the dated bill of sale or packing list as evidence of the purchase date.
6. In the event of any claim of a defect covered by this warranty, the customer should take the following steps:
  - Contact Micro Audiometrics Corporation for Customer Assistance regarding the nature of the claim.
  - The returned audiometer and headset should be re-packed in its original shipping carton, with the audiometer held in place by the plastic film of the retaining panel. If the original shipping carton is not available, choose an appropriate carton with sufficient padding to prevent shipping damage.
  - Return the instrument to the nearest Micro Audiometrics Authorized Equipment Service Center, or to Micro Audiometrics Corporation, 655 Keller Rd, Murphy, NC 28906.
  - The customer is responsible for shipping expenses.

## **CONTACT INFORMATION**

**For additional information or assistance, contact your local distributor or contact Micro Audiometrics directly at:**

**Micro Audiometrics Corporation  
655 Keller Rd., Murphy, NC 28906 USA**

**Toll-free: (866) EARSCAN  
3277226**

**Voice: (828) 644-0771  
Fax: (828) 644-0772**

**Product and company information is available on the internet:**

**[www.earscan.com](http://www.earscan.com)**

**For product information or inquiries, send email to:**

**[sales@microaud.com](mailto:sales@microaud.com)**

**For product support or technical issues, send email to:**

**[support@microaud.com](mailto:support@microaud.com)**